

Remarks

Rejection of Claims under 35 U.S.C. §112, first paragraph

The use of the phrase "single hard *grids*" formed the basis for rejecting claims 1-5, 8-12 and 15-18 under 35 U.S.C. §112, first paragraph, as not supported by the specification. The amendment that added the term "grids" was an error. Applicant's attorney explained in a November 2003 telephone call with the Examiner that the term intended to be used was "grain", and the present amendment to claim 1 corrects this error. Applicant thanks the Examiner for identifying the mistake.

Rejections of the Claims Based on Cited References

Claims 1-5, 8-12 and 15-18 are pending in the application. The above cited action rejects:

(a) claims 1-5, 8, 12 and 16-18 under 35 U.S.C. §102(b) as anticipated by, or, in the alternative, under 35 U.S.C. §103(a) as obvious over Saam¹;

(b) claims 1-3, 5-12, 14, 15, 17 and 18 as anticipated by, or, in the alternative, obvious over Swei²;

(c) claim 1 as anticipated by, or, in the alternative, obvious over Chen³; and

(d) claim 13 as obvious over Swei in view of Erickson⁴.

Responsive to such grounds of rejection, Applicant respectfully submits the following points for the Examiner's consideration.

(A) "Hard" materials typically have characteristics including a high degree of hardness, a high degree of abrasive resistance, high melting points, and chemical durability. Hard materials can be generally classified into metallic hard materials (*e.g.*, carbides, nitrides, borides, and silicates, etc.), non-metallic hard materials (*e.g.*, natural and synthetic diamonds, corundum, etc.) and cermets (sintered mixtures of metals and at least one ceramic phase, such as AL₂O₃ chrome).

¹ U.S. Patent No. 4,244,869 issued January 13, 1981, to John C. Saam

² U.S. Patent No. 5,182,173 issued January 26, 1993, to Gwo Swei

³ U.S. Patent No. 5,991,591 issued November 23, 1999, to Chen, *et al.*

⁴ U.S. Patent No. 5,645,619 issued July 8, 1997 to Erickson, *et al.*

The presently claimed invention is directed to providing a hard grain material, the surface of which is covered by a thin layer of polysiloxane. The two pending independent claims, 1 and 12, have been amended to recite the limitations of having a starting material *having a hardness ($HV_{0.2}$) ≥ 15 GPa, the surface of which has a polysiloxane coating in an amount from 0.001 to 10%-wt relative to the hard material* and including a specific chemical formula for the polysiloxane in which *R is hydrogen, an alkyl and/or phenyl group and non-reactive as incorporated in the polysiloxane, and n is an integer between 1 and 100*. This layer reduces high capillarity of the hard material in relation to low-viscosity fluids as well as diffusion of light when covering the hard material with a lacquer or a laminate layer for improving wear resistance.

(B) Saam is directed to an aqueous silicone emulsion which is turned into a stabilized, aqueous emulsion of a polydiorganosiloxane with an end-portion hydroxyl group by adding an alkali silicate metal. After removal of the water phase (even at room temperature) this emulsion is able to provide an elastomeric product. The elastomeric product is formed due to a network established by the alkali silicate with polydiorganosiloxane via a functional end-portion hydroxyl group of the polydiorganosiloxane. The presently claimed invention, however, as recited in now amended Claim 1 recites a hard material coated by a specific polysiloxane layer with non-reactive end groups that may be produced by mixing the hard material with a polysiloxane emulsion. After such treatment, the polysiloxane remains unaltered - there has not been any chemical reaction and no copolymer nor any elastomer has been produced. The instant action states that Applicant has not claimed a non-elastomeric layer, but the polysiloxane of the presently claimed invention does not, as opposed to that used in Saam, have any specific reactivity.

In the formula recited in amended claim 1, R, defined as hydrogen, alkyl or phenyl group, is used as a creeping substance for filling capillaries and pores and to moisten edges. In Saam, there is a polymer matrix into which fillers are inserted. The fillers described by Saam serve to vary the characteristics of the elastomer produced. The aim still is an elastomer which preferably is used for layers and which additionally contain fillers. These, however, are not granular *coated hard materials*, rather, Saam's fillers are part of the layer (of the elastomer) itself and form its characteristics.

As a means for preventing wear in transparent layers, such elastomers would be most unsuitable. Furthermore, Applicants respectfully submit that it is not appropriate to compare the hardness of the Saam's fillers with the hard material of the presently claimed invention. Among the fillers referred to in Saam, quartz may well be the hardest one, having a $HV_{0.2}$ = about 9.5 Gpa. Saam's group of fillers as a whole are of a different class than those contemplated herein. Alumina (aluminum oxide) of Saam's group is considerably softer than and is not to be confused with α -alumina (corundum). Any person of average skill in the art who wishes to provide an elastomeric product in the form of a layer following Saam would find it obvious to take alumina and more particularly the alumina described in the 3rd example of Saam, not corundum or the like.

In the presently claimed invention, the hard material has a hardness of $HV_{0.2}$ equal to or greater than 15 Gpa (all claims). The fillers referred to in Saam do not meet such limitation explicitly or inherently.

Claim 1, as amended, now also recites relative amounts of hard material and polysiloxane coating that are not taught or suggested by Saam. The different objectives of Saam and the presently claimed invention require completely different compositions. According to Saam, an elastomer layer so produced, optionally, can have fillers inserted into it. The quantitative ratio between filler and elastomer is clearly in favor of the elastomer, as may be gathered from the 3rd example of Saam where 75 g calcined alumina are added to 200 g polymer emulsion. Any material having such a layer – even if it was the intended layer and if it was a hard material in the sense of the present invention – would not be suitable in the sense of the presently claimed invention. According to the presently claimed invention, it is preferred to have 0.001 and 10% in weight (more preferably 0.01 to 5% in weight and most preferably 0.1 to 1.5% in weight) in relation to the hard material.

(C) Swei, which the Action points to as supporting the rejection of claims 1-3, 5-12, 14, 15, 17 and 18, is directed to a filler consisting of an inorganic core and a layer of a network silicone elastomer that covers the inorganic core and that is *chemically bound* to the core (col. 1, lines 30-

33.) The goal is to produce, by means of these covered fillers, a thermoplastic polymer matrix of a composite material the tenaciousness of which is improved.

For this purpose, a mono-functional polysiloxane with an end portion functional group is transposed with a multifunctional silane in order to produce multifunctional end portion polysiloxane that, during the process of coating, is increasingly netted to an elastomer and bound to the inorganic core (col. 1, lines 39-49.) The high-polymer silicone network of Swei will not fulfill the function of the silicone oil (not having any reactive functional groups) which is used as a creeping substance in the present invention.

With respect to the hard material layer of the presently claimed invention, however, a polysiloxane without any functional group is applied to the surface and dried. Again, no chemical reaction or any polymerization occurs, nor is the polysiloxane chemically bound to the hard material. The presently claimed invention, rather, applies only a slight polysiloxane layer to the surface in order to - due to the excellent creeping qualities of polysiloxanes - adjust micro edges, fissures, creases, and step-like shiftings of the hard grid so that low-viscous liquids may not infiltrate into the grid and so that no diffuse light dispersion will occur at edges and creases.

A hard material grid thus treated is excellently suitable for preventing transparent layer wearout. The Swei filler, however, which shows a rubber-like shroud that is rigidly bound to the surface, may obviously not be used for such purposes.

Regarding hardness, it should be noted as discussed above in connection with Saam, that if an artisan tries to produce a filler material following Swei, it would not be reasonable to use hard material having a hardness of $HV_{0.2} \geq 15$ GPa. Applicants respectfully submit it is not proper to presume that the fillers described in Swei meet the hardness requirements according to the present invention. Rather, a person skilled in the art would suppose that the hardness of all fillers referred to in this document is considerably below 15 GPa. Amorphous fused silica (Harbison-Walker GP-71) (see col. 7, lines 56-60) is the filler preferred in Swei. The hardness of this filler is about 6 GPa.

(D) Chen (which serves as the basis for the rejection of claim 1) is directed to a circonia ceramic roller for copiers, that is covered with a polysiloxane layer as a measure of prevention.

Used for this purpose are polysiloxanes with functional groups (col. 11, ll. 23-55.) The presently claimed invention differs in that it requires not forming moulds, but hard material grids.

(E) With reference to the rejection of claim 13 over Swei in view of Erickson, the comments above made with respect to the shortcomings of Swei in teaching or suggesting the limitations of independent claim 12, from which claim 13 depends, are relevant but not set forth again here. Erickson is directed to the production of a sol-gel abrasive where there is added to a boehmite sol - a precursor compound for Fe_2O_3 and a dispersable SiO_2 compound. The sol thus produced is gelatinized, calcined and sintered and then prepared as an abrasive. The Erickson method produces an abrasive which, apart from a main component Al_2O_3 , additionally contains iron oxide and silicon oxide (see Erickson's claim 1). Erickson's claim 31 describes a variant of the method where, first, a porous precursor compound is produced for an abrasive which is impregnated with a SiO_2 -containing compound and then sintered. In both cases is produced an abrasive on the basis of Al_2O_3 , which additionally contains iron oxide and silicon oxide, ideally homogeneously dispersed throughout the complete abrasive.

The present invention as recited in amended claim 13 is something completely different -- a hard material coated with a polysiloxane layer with a hardness of ≥ 15 GPa. This layer avoids or reduces high capillarity of the hard material in comparison to low-viscosity fluids as well as diffusion of light when covering the hard material with a lacquer or a laminate layer for improving wear resistance. Swei and Erickson both refer to substances and methods having only a little in common with the substances and method of the presently claimed invention. Therefore, it is respectfully submitted that, a combination of the teachings of Swei and Erickson does not lead to the method and product in accordance with the present invention.

None of the cited references, either alone or in combination, teach or suggest explicitly or inherently the presently claimed invention recited in claims 1, 3, 4, 8, 10-12, or 15-18, as amended. Thus, and in consideration of the removal of all grounds for claim rejections, it is therefore submitted these claims are allowable, and notice thereof is earnestly solicited.

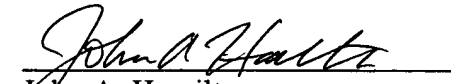
Application Ser. No.: 09/621,788
Atty. Docket No.: 12707 P03
Reply to Office Action dtd. 28 November 2003

If any questions remain, please call Applicant's attorney, collect, at the number given above. If any sums are owed due to claim adjustments, please debit or credit Deposit Account 03-2410, order 12707-P03.

Respectfully submitted,
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Dated: April 28, 2004

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12707-3_RespRCED_042804